THE EFFECTIVENESS OF DIFFERENT GRASS TYPES FOR POLLUTANTS REMOVAL IN LEVEL SPREADER SYSTEM

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ABSTRAK

Air merupakan salah satu elemen yang paling penting bagi manusia dan organisma yang lain. Namun, pencemaran air telah menjadi satu masalah yang semakin serius dan mendatangkan kesan buruk terhadap kesihatan manusia. Air larian permukaan dan air sisa domestik di kawasan bandar adalah diantara punca yang menyumbang kepada pencemaran sumber air seperti sungai dan tasik. Justeru itu, kawalan punca merupakan kaedah yang paling efektif untuk mengangani masalah pencemaran air ini. Sistem *Level Spreader* merupakan salah satu kaedah pengurusan terbaik yang boleh mengawal bahan pencemar di dalam air larian permukaan dan air sisa domestik dari memasuki sumber air. Dalam kajian ini, rumput *carpet* dan rumput padang digunakan untuk menguji keberkesanannya dalam penyingkiran bahan cemar dengan menggunakan sistem *Level Spreader*. Keputusan analisis makmal menunjukkan bahawa sistem *Level Spreader* dengan rumput *carpet* sebagai jalur pertumbuhan adalah lebih efektif dalam penyingkiran bahan pencemar. Keputusan ujian makmal menunjukkan rumput *carpet* mampu menyingkirkan kira-kira 45% kekeruhan, 52% pepejal terampai, 43% minyak dan gris, 35% ammonia nitrogen, 28% zink and 22% nikel. Rumput *carpet* lebih efektif berbanding rumput padang kerana ianya tumbuh dalam kepadatan yang lebih tinggi. Oleh itu, ia menyediakan luas permukaan yang lebih tinggi untuk mekanisma penyingkiran bahan cemar berlaku. Selain itu, analisis juga menunjukkan bahawa penyingkiran bahan cemar juga disebabkan oleh penyerapan bahan cemar tersebut secara terus oleh rumput sebagai nutrien pertumbuhannya. Rumput *carpet* mampu menyerap lebih banyak bahan pencemar berbanding rumput padang.

ABSTRACT

Water is one of the most essential elements for human and other organisms. However, water pollution has become a serious problem and gives bad impact on human health. Stormwater runoff and sullage water from urban areas have been recognised as some of the main sources that contribute to the water pollution in the receiving waters such as rivers and lakes. Level spreader system is one of the best management practices used to reduce pollutants in urban runoff and domestic wastewater before entering the receiving watercourse. In this study, field grass and carpet grass were used to identify their efficiency for pollutants removal in level spreader system. Laboratory analysis results shows level spreader with carpet grass as vegetative strip is more effective in pollutants removal. It can remove approximately 45% turbidity, 52% TSS, 43% oil and grease, 35% ammoniacal nitrogen, 28% zinc and 22% nickel. Carpet grass is more effective because it grows in higher density than field grass, thus providing more surface area for treatment mechanism to take place. Besides that, analysis of grass samples shows that plant uptake mechanism contributes to the pollutants removal in level spreader system. Carpet grass is able to take up more pollutants than the field grass.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Water is the second most important element after oxygen. Human being needs a minimum of 1.5 liter of water per day. Only a small fraction of the world's freshwater resources is readily available. Estimates suggest that the freshwater in rivers and lakes constitutes about 0.3 % of the overall freshwater resources. Groundwater resources are much larger or about 30 % of all freshwater resources. Water locked up in glaciers and permanent snow cover constitutes the largest source of freshwater. Usable freshwater resources that are the freshwater in rivers, lakes and aquifers, groundwater resources account for about 99 %.

Due to the population growth and the expansion in urbanisation, industrialisation and irrigated agriculture are imposing rapidly growing demands and pressure on the water resources, besides contributing to the rising water pollution.

1.2 Problem Statement

Urbanisation results in the growth and spread of impervious areas and diversification of urban landuse practices with respect to the hydrologic and environmental terms. The main function of urban areas can be classified as administrative, industrial and business. In some river basin, development pressures on the water environment are now at an alarming level. Of significance are Sg. Klang, Sg. Langat, and Sg. Buloh (Selangor), Sg. Linggi (Negeri Sembilan), Sg. Melaka (Melaka), Sg. Skudai (Johor) and Sg. Kinta (Perak). It is widely recognized that landuse changes from rural to urban or industrial areas cause local runoff impacts on receiving water flow, quality and ecology (MASMA, 2000).

Major problems in Malaysia related to urban water management include the shortage of water, pollution of water bodies, urban flood hazards, and deterioration of the environment surrounding rivers. Stormwater runoff contributes to receiving waters a significant part of total loads of such pollutants as nutrients, heavy metals, oil and grease, and bacteria. Some of the stormwater- associated problems being encountered in Malaysia are (MASMA, 2000):

- Construction activities and mud flows;
- Flash flooding;
- Water pollution and ecological damage;
- Urban slopes failures;
- Traffic disruption and accidents;
- Surcharges and overflows from wastewater facilities;
- Garbage and floating litters;
- Sedimentation.

Many urban rivers, lakes, and ponds, are rendered unfit for use, either in-stream or off-stream, as they are flooded and overloaded with non-point sources

pollutants in wet periods and their water bodies experience more concentrated point-sources due to reduced baseflow contribution in dry periods. An interpretative evaluation of river water quality has revealed that increasing proportion (more than 60%) of the Malaysian inland waters are failing due to pollution contributions from the non point sources or storm-generated activities, particularly in urban areas.

The main form of control of stormwater runoff quality adopted in Malaysia has been the installation of sediment basin to control the transport of sediment from land development and construction sites. Source control and treatment control of stormwater runoff from established urban areas to remove urban pollutants and enhance the quality of discharges to receiving waters have not been addressed.

Source controls BMPs are those practices that tend to keep both runoff and pollutants contained at their source. These include pervious areas and buffer strips towards which runoff is directed, integration controls, and porous pavement. Treatment control BMPs is the strategy adopted to protect the quality of local streams, lakes, and river systems. Treatment control BMPs may be adopted such as the establishment of urban lakes, primarily as biological treatment systems. It also implemented by incorporating of gross pollutant traps on inlet to urban lakes and water quality control ponds and wetlands to intercept trash and debris and the coarser fractions of sediments (MASMA, 2000).

1.3 Objectives of Study

1.3.1 To determine the effectiveness of pollutant removal in urban runoff and domestic wastewater using level spreader system.

1.3.2 To determine the effectiveness of pollutants removal using different grass types which are field grass (*Ageratum coryzoides)* and carpet grass (*Axonopus affinis)* in level spreader system.

1.4 Scopes of Study

1.4.1 This study will concentrate on the effectiveness of level spreader system in removal of pollutants in water obtained from UTM river that received pollutants from *Cafeteria, Arked Cengal.*

1.4.2 The effectiveness of level spreader system will be determine based on the pollutants removal efficiency using different types of grass/plant.

1.4.3 In this study, 2 different types of grass will be used in order to study the efficiency of level spreader system. Other factors that need to consider are length of grasses strips, width, water flow rates, and grass density.

1.4.3 Water quality parameters involved in this study are DO, pH, turbidity, suspended solid, oil and grease, turbidity, ferum and nickel.

1.5 Importance of the Study

Level spreader system is among the simplest and most cost-effective form of storm water control measures. So, this study is conducted to assess its performance.

1.6 Expected findings

1. The level spreader system is effective as pollutants removal for polluted water. High water quality level in treated water is obtained at the end of experiment.
2. Level spreader system with different grass types will give the different pollutant removal efficiency due to grass characteristic.

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